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Bang & Olufsen Beolab 5 Loudspeakers

Few hi-fi companies can claim a heritage that goes all the way back to 1925. The Danish Bang & Olufsen operation, better known as B&O, has not only been in business that long; they've also come up with more than their fair share of hi-fi innovation in those nearly 80 years.

But the B&O of today could be said to have long outgrown the comparatively cozy world of hi-fi. With 3000 employees, it's many times the size of any specialist hi-fi brand, and has become so by successfully carving out its own niche of stylish, upmarket, "designer" systems that appeal to a much broader spectrum of consumer. Luxury TV sets long ago joined audio-only equipment in B&O's product portfolio, and the company has pioneered multiroom operation, and even added stylish cordless phones, to an operation increasingly lifestyle-oriented and distributed through single-brand outlets. But one suspects that this has not always been what key B&O engineers, who have retained their enthusiasm for serious hi-fi, might have wanted.

The recent hiring of a new CEO might explain what seems a shift in emphasis that is exemplified by B&O's new Beolab 5, one of the most radical, complex, and elaborate loudspeakers ever made. Clever styling is still an important ingredient, but performance and innovation were clearly equally high on the design agenda.

Weighing 124 pounds, the Beolab 5 carries a similarly hefty price of $16,000 USD per pair. But besides its four-way driver lineup and an intriguing method of controlling sound dispersion, the 5 also includes several thousand (!) watts of amplification and some very clever digital signal processing.

The styling itself is strikingly unconventional, with a conical speaker distinctly reminiscent of *Dr. Who*'s Daleks. But this unusual and complex form, made of rib-reinforced structural plastics, closely follows function. The big bonus of a cone shape is that it enables a relatively compact and visually discreet design to accommodate a 15" downfiring bass driver, mounted in the base.

Overview

Finished in a combination of matte black and polished aluminum, the Beolab 5 stands 38" high, though its taper makes it look smaller. The cone shape is interrupted by three silver-surfaced discs of different sizes, and a narrow "neck." In this four-driver design, the signal is handed from the 15" woofer to a 6.5" upper-bass/lower-mid unit, then to a 3" fabric-dome for the upper midrange, and finally to a .75" fabric-dome tweeter. Each driver has its own digital power amplifier, so there's no need for a conventional passive crossover network, which avoids the inevitable compromises such circuitry involves. Instead, the Beolab 5 is an "active" loudspeaker that performs the required crossover and equalization functions using flexible low-power electronics that effectively sit between the preamp and the multiple power amps. These amps have a total power output of a massive 2500W, with 1000W each for the lower and upper bass drivers (where substantial, power-consuming equalization is used to keep the enclosures compact),

plus 250W each for the two higher-frequency drivers.

That's intriguing enough, but the Beolab 5's true originality lies in two key technical features that are genuinely unique. The first provides close control over the directivity of the upper-mid and high-frequency drive-unit outputs, in order to deliver superior two-channel imaging almost irrespective of where the speakers are placed in the room. The other is claimed to both measure and equalize out the uneven variations in bass output that are the inevitable consequence of a speaker's interaction with a room's main modes.

B&O has always been rigorous in the application of the scientific method to the listening experience. Through extensive controlled listening tests, they've found that the best way to achieve the most precise stereo imaging is to avoid floor and ceiling reflections as much as possible. They do this in the Beolab 5 by facing the midrange and treble drivers upward, then using elliptical, carefully shaped acoustic mirrors to bounce their sound forward, toward the listener.

The use of reflectors as acoustic mirrors is hardly new -- Lowther and Wharfedale used them as far back as the monaural era, and the approach is still found in some symmetrical, omnidirectional speaker designs, such as the horn-loaded Duevels. A well-known recent example was Canon's asymmetric Wide Imaging Stereo line, which was available through the early 1990s. B&O's innovation has been to use elliptical sections to form the reflective surfaces. B&O engineers worked alongside patent-holders Sausalito Audio Works, a US pro-audio company, to refine this particular approach, which seems to offer substantial advantages in precision of focus and phase coherence over flat-surface reflectors.

The Beolab 5's elliptical reflectors are shaped to cover a 180-degree semicircle horizontally, and to restrict the vertical "window." Nearly all of a driver's output is thus directed forward, reducing the proportion of room-reflected sound the listener hears, effectively increasing the efficiency in the listening zone, and creating a speaker whose output is substantially independent of proximity to the rear wall. Because the Beolab 5 effectively has its own built-in "rear wall," it is immune from reflection-induced colorations caused by the actual room wall behind it.

The Beolab 5's elliptical acoustic mirrors also avoid scrambling the sound's phase coherence, as happens with flat mirrors. An ellipse is a "stretched" circle that has not one but two center points, and the sum of the radii from both centers to the edge of the ellipse remains constant. Place a drive unit at one of the centers, and the sound reflecting off all parts of the ellipse will always pass through the other center. Because this path length remains constant, phase coherence is also maintained.

What happens at the bass end is even more radical. A number of companies are currently attempting to use digital signal processing (DSP) techniques to counter the unevenness created by interactions between the speaker and the room modes. Carrying out the equalization itself is relatively easy; the difficult task is working out what filtering is needed to suit a particular listening room and the positions of the speakers therein.

B&O's implementation is particularly neat and clever. In the Beolab 5, the entire bass-EQ setup process is automated. When you press on the topmost silver disc, a measuring microphone fitted to a motor-driven boom emerges from near the bottom of the speaker, below the downward-firing bass driver. A complex test-signal sequence stored in a memory chip is then activated, the results picked up by the mike. B&O's software then reads the room's modal structure by comparing two nearfield measurements: one very close to the woofer, the other a few centimeters farther away. The radiation resistance "seen" by the bass driver is then calculated, and then the digital filtering needed to create an even average sound pressure throughout the room. The entire procedure takes about 30 seconds for each speaker.

B&O does not attempt to equalize the Beolab 5 for any particular listening zone, but rather to achieve a broad average that smooths out the more extreme variations. Subjected to my usual run of farfield, in-room-averaged measurements, the Beolab 5 still showed a significant presence of room-mode peaks and troughs, though its balance was smoother than most through the bass region. It was certainly much more flat and even than before its self-calibration, and the speakers' performance proved impressively consistent regardless of their placements in my room.

Overall, and after applying EQ, the averaged in-room tonal balance was a little strong through the 20-200Hz bass decade, and a little shy through the midband decade (200Hz-2kHz). The full range, from 20Hz all the way up to 20kHz, was notably flat and seamless, however, and only marginally affected by wall proximity (though free-space siting is still preferable).

Much of the Beolab 5's internal volume is taken up by its elaborate electronics, including the very compact digital power amplifiers, which are made by B&O subsidiary ICEpower. The very high (1000W each) levels of power feeding the bass drivers are necessary in order to provide two stages of EQ. B&O compensates for this by mounting the bass drivers in relatively tiny sealed enclosures: just 1 cubic foot for the 15" cone, and a mere 0.17 cubic foot for the 6.5-incher. There's also a substantial additional 10dB boost capability in order to apply the room-mode-compensation EQ. The high (93%) efficiency of these power amps means the enclosures can be completely sealed, with no need for any special cooling arrangements beyond their very modest heatsinks.

The Beolab 5 is a very *digital* loudspeaker. While it can accept either analog (phono socket) line-level signals or direct digital (S/PDIF) connection, it immediately converts an analog input into digital code via a 24-bit/96kHz A/D converter. The DSP processing is handled by a 32-bit Sharc 2 DSP, while a 512kbyte Flash-ROM memory permits upgradeability.

The Beolab 5 also incorporates remote-controlled adjustment of volume; for example, a pair of them could be connected directly to a fixed-output CD player. I disabled this function for this review, however, and drove the speakers directly from the analog stereo outputs of a Naim NAC 552 preamplifier. Because the Beolab 5 is intended to be used in an all-B&O system, I then needed a special handset to power it up. This is not automatically supplied with the speakers.

Listening

During a visit to the B&O factory, and before seeing or knowing anything about the Beolab 5, I underwent a blind listening session in a room of typical domestic size. My first impression was of the speakers' exceptionally precise and detailed stereo perspectives, and its superbly evenhanded neutrality. Some weeks later, in my own listening room, I got precisely the same impressions, and just as vividly.

The obvious conclusion is that the Beolab 5's system of acoustic mirrors works as claimed. Furthermore, there seemed to be no obvious downside to the use of these mirrors. My past experience of reflector speakers had led me to anticipate a measure of coloration, but that wasn't at all the case with the Beolab 5. Indeed, coloration was exceptionally low throughout the audioband -- the Beolab 5 is among the most neutral speakers I've ever heard.

The speaker's cleverest trick was the way it seemed to acoustically "disappear." I simply wasn't aware of the location of the speakers themselves, only of the precisely detailed and well-focused soundstage they created, on which all instruments and voices were portrayed with unusually natural perspectives and believable proportions.

Such exceptional imaging tends to be found only among very small loudspeakers, and is therefore nearly always accompanied by limited bass weight and extension. That was not a problem with the Beolabs. Indeed, their bass alignment -- no doubt assisted by B&O's mode-compensation system -- was just about as good as it gets, delivering magnificent weight and power whenever the program material required, while neatly avoiding the midbass thump and thickening that all too often accompany less capable speakers' attempts to deliver deep-bass output.

Even so notoriously thumpy a CD as Wyclef Jean's *Carnival* [Divine Recordings 160013] -- especially track 18, "We Trying to Stay Alive" -- came through crisp and clean, with decent punch and little if any overhang. And the Beolab 5 could go very, very loud indeed -- as long as your nerve holds, your building is strong, and your neighbors are tolerant. No subwoofer was needed, and the speaker had no trouble sorting out the subtle tonal variations, rhythmic complexities, and dynamic shadings that underpin Massive Attack's splendid, if dark, *Mezzanine* [Virgin 45599].

The same was true with another of my favorite bass-torture CDs, Mari Boine's *Eallin* [Lean/Sonet Antilles 533799-2], though this album also served to highlight the efficacy of B&O's bass EQ system. I'd taken the disc with me to the B&O factory, where I tried playing it loudly during one of the demonstrations. To general consternation, the bass end went into overload. B&O's top engineer then figured out that the initial EQ setup had been done with the room's large double doors closed; they were now wide open, which changed the room modes enough that the specific EQ settings were no longer properly matched. We left the doors open, took one minute to re-run the setup procedure, then played the same track at the same volume. This time, there was no hint of overload.

Crucially, there were none of the "woody" or "boxy" colorations, with their consequent thickening of

textures, which tend to occur with large conventional speaker enclosures. That's partly because the Beolab 5 has no wooden box. While the speaker's relatively small and asymmetric plastic enclosure wasn't entirely free from vibrations, it seemed to have no obvious or detectable sonic signature.

Surprisingly, in view of the Beolab 5's very open and genuinely neutral tonal balance, its sound showed few if any aggressive tendencies, remaining notably consistent in character even when played at very high levels. Perhaps this is a consequence of the active drive and the consequent avoidance of a passive crossover network, or perhaps it's a function of the distribution control and consistency.

Conclusions

Differences in sound distribution play a fundamental role in defining each loudspeaker's unique sonic "character." The opposite poles are represented by omnidirectional designs on one end and dipole panels and horns at the other; the former create a good impression of bringing musicians into the room, while the latter tend to create a more precise view of the construction of the recording itself. An important strength of the Bang & Olufsen Beolab 5 is that it seems to combine much of the best of both worlds -- not quite *all* the best, but just about the best compromise that I've heard.

The Beolab 5 is so capable in so many respects that it leaves very little room for criticism. Its resolute neutrality can give the impression of some dynamic understatement, and I might have wished for a bit more vim and vigor in the presentation, with tauter timing and more expressive dynamic tension. Some audiophiles might also wish for a little more absolute transparency; the Beolab 5 didn't quite run the shivers up my spine that a triode-driven full-range horn system does.

The Beolab 5 will appeal more to the cerebral consciousness than the emotional subconscious, its strengths lying more in understatement and discretion than in drama and tension. But by that token, no loudspeaker in my experience has been more able to sonically "disappear" from the room, leaving just the sound of music hanging there in air. Few other speakers have such a small sonic signature, and none of those that do combine it with the Beolab 5's exceptional bass power and extension. While it's true that the room compensation might have been more effective, the crucial factor is that the excellence of this revolutionary loudspeaker should be fully and consistently realized regardless of the room in which it's used. That alone represents a true reinvention of the loudspeaker as we know it.

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Bang & Olufsen Beolab 5 Loudspeakers
Price: $16,000 USD per pair.
Warranty: Five years parts and labor.

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